phila galathea, Mill., *Athetis terrea*, Frr., *Calamia virens*, L., *Phytometra festucae*, L., *P. v. argenteum*, Esp., *P. bractea*, Schiff., and *P. deaurata*, Esp.

This unfavourable weather, together with a frontier mobilisation, drove us home to England some few days before we had intended. Difficulties of identification have made it impossible to do more than lay the foundations of a list of the Microlepidoptera of Névache, but it is hoped that in due course all the records will be published in the Second Part of Monsieur Lhomme's " Catalogue des Lépidoptères de France et de Belgique," now in course of preparation. At any rate we spent a very pleasant holiday, for the village grows every year more civilised, and we hope that when peace returns again to western Europe we may spend the yet richer months of June and July among these well-remembered mountains, so rich in rare plants and insects.

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A NOTE ON SATURNIA PAVONIA, L.

By P. B. M. Allan.

A few summers ago I reared some two dozen larvae of *Saturnia pavonia*, L., from the egg, and on the following 1st February I brought a dozen cocoons into a room in which the temperature was usually about 58° F. by day, falling to 50° F. at night.

On 25th February the first moth, a female, emerged at 11.50 p.m., and moths continued to emerge until 6th March. It took this female six minutes to get out of her cocoon, from the time when her head appeared until she was free. She did not pull herself out but held on to a stalk, her body working itself upwards and out of the neck of the cocoon by peristaltic contractions of the abdominal somites, the moth resting for a moment or two after each " wave " of contractions. When free she crawled rapidly to the top of the stalk to which her cocoon was attached, waved her legs about for a few moments as though she would climb higher, and after one minute came to rest. Four minutes later her wings began to expand, and after 55 minutes they were fully expanded. During wing expansion there was no perceptible movement of the body: so far as I could see, watching through a lens, the insect was absolutely motionless. The forewings began to expand first.

The next moth which emerged, a male, did things much more quickly. He was free of the cocoon at 11.53 p.m., and by 12.5 a.m. [0.5 a.m.] his wings were fully expanded.

On the last day of February there were snowstorms, with a hard frost in the night of 28th February-1st March. Three moths emerged on the 28th (2 ♂♂ at 11.30 a.m. and noon; 1 ♀ at 4 p.m.), and towards midnight another male began to emerge; but the temperature of the room falling sharply to 40° F. when an electric stove was switched off, he stuck in the neck of his cocoon. Next morning I cut him out and put him on the mantelpiece; he was very feeble and covered with meconium; but the following evening, being nearly baked over the electric fire, he became vigorously active at 11 p.m.; though of course it was then too late for him to expand his wings.

By the way, a number of the males which emerged in my room became active late at night. In a state of nature, do male *S. pavonia* fly by night as well as by day? On the 5th June 1937 my friend, Mr Clifford Craufurd, caught at midnight a male Fox Moth which flew to his lamp. Other entomologists may have had the same experience, but neither he nor I have seen it recorded in print. Barrett makes no mention of the male *pavonia* flying by night, and of *M. rubi* he remarks " the male appears to fly only in the daytime." If any readers of this paper have taken male *pavonia* during the hours of darkness I shall be grateful if they will let me know.

It was easy to show that with *S. pavonia* temperature controls (1) eclosion from the pupa case, (2) emergence from the cocoon, (3) the vascular pressure on the blood which brings about wing expansion. I found that by altering the temperature sharply it was possible to produce partial crippling, and that this artificial crippling invariably affected the hindwings.

Everyone who has bred *S. pavonia* under observation will have noticed that eclosion is always preceded by a certain " rattling about " of the pupa in the cocoon (though this " rattling " does not always prognosticate immediately impending emergence; for example, some of my pupae which " rattled " on 14th February did not emerge until the 26th, and they were silent between the 15th and the 25th). What is the significance of this rattling about of the pupa in the cocoon? While some of them rattled a week and more before the moths emerged, all of them—so far as I could tell—rattled at one time or another before they emerged. A few never rattled at all, and these pupae were found later to be dead. Is the movement essential to eclosion? If so, its performance some days before eclosion took place with my pupae might possibly have been due to the fact that these particular specimens were ready to emerge but that the temperature was too low, or that some essential factor was lacking.

In an attempt to solve this problem, on March 20th (no emergences having occurred since March 6th) I cut the tops off six of the cocoons, to see whether this would have any effect on the movements of the pupae or of eclosion. The pupae in these cocoons were lively.

On the same date (March 20th) I brought into my room the second dozen cocoons. Moths began to emerge from this second batch on April 5th, and the last two left their cocoons on April 22nd.

None of the six pupae in cocoons with the tops sliced off ever gave rise to a moth. On September 5th (they being then 12½ months old) they were all alive; but by November 12th one had died. On the 1st March following (they being then about 18½ months old) they were still alive; but on March 12th all were dead except one. This was obviously due to my mismanagement, as they had been in a warm room for more than a year and were dried up.

On March 12th I found in a larva cage an unopened cocoon containing a dead pupa. So I sliced the cocoon in half transversely with a razor, removed the dead pupa, put my surviving pupa inside the cocoon, and glued the two halves of the latter together.

The following evening, the temperature in the room rising to 62° F., the pupa started to " rattle." Next afternoon (March 13th) it rattled for an hour; but thereafter it was silent, and a week later I cut the cocoon open again and found that the moth, a female, had freed her abdomen of the pupa case but had been unable to push off the fused thoracic appendanges and had died.

Now, although I had failed to find out why the pupa "rattled," I obtained what may possibly be a clue by watching the six pupae when they "rattled" in their truncated cocoons. I noticed that the movement was not a lateral one, *i.e.*, from one side of the cocoon to the other, but a "jump" upwards and a fall back. This "jump" was apparently effected by flexing the abdominal somites and then extending them sharply. But further observation showed that there was more in it than that. The cremaster of *S. pavonia* is interesting. It consists of about 30 bristles, varying slightly in length and thickness, which are spread out roughly fanwise. The inside of the cocoon is extremely hard and so glossy as to have the appearance of being varnished. But although slippery it is not smooth in the sense of being flat: its surface is uneven and irregular. So that if the pupa curved its abdominal segments until the cremaster was "spiked against" the side of the cocoon (the unevenness giving the cremaster a purchase), with the dorsal surface of the thorax resting against the opposite wall, then straightened itself out sharply, the pupa would be forced upwards on the glossy surface of the cocoon. This, so far as I have been able to observe, is what actually happens when the pupa "rattles" in its cocoon.

But what have these movements to do with eclosion? Moreover, the pupa is able to make them whether its cocoon be intact or truncated. The only solution I can suggest is this—and do please bear in mind that it is no more than a suggestion:—

When the pupa "jumps" upwards its anterior end is momentarily wedged in the bottle-necked upper part of the cocoon. This momentary wedging enables the imago to obtain some kind of purchase for the making of a muscular effort which splits the pupa case along two lines of cleavage, a transverse one between the 3rd thoracic and 1st abdominal segments, continued posteriorly and ventrally along the inner margins of the wings, and a longitudinal one along the middle of the three thoracic segments. Then, as the pupa falls back to the wider bottom of the cocoon, the moth pushes from itself the fused appendages and thoracic segments, and emerges. If the top of the cocoon be sliced off, the pupa is unable to obtain that momentary wedging which enables the imago to split the case.

On the other hand, since a violent muscular effort by an insect is usually followed by a period of rest, it may be that the "jumping" effects the rupture of the pupa case along the line of one cleavage only, the second rupture being made some time later while the insect is lying at the bottom of the cocoon. If the temperature fell immediately after the first rupture was made, the insect might lie inert until the requisite degree of warmth urged it to effect the second rupture, which is made immediately prior to emergence from the cocoon. This part of the problem could be solved by opening a cocoon immediately after the first "rattling" has been heard, and examining the pupa.

S. pavonia is not common in my district and I have no more pupae with which to experiment further. Will some reader of this paper continue these observations? The simplest way would be to watch the pupa closely in its cocoon, by the expedient of cutting windows in opposite sides of a *pavonia* cocoon with a razor and glueing cellophane over the apertures. It would also be interesting to see whether any emergences took place among a dozen or more pupae after their cremasters had been snipped off, the pupae being replaced in the opened cocoons and these sealed again.

Does anybody know whether the double spiked cremaster of certain species which pupate in the ground plays a part in eclosion?

TWO NEW ABERRATIONS OF BRITISH BEETLES.

By Horace Donisthorpe, F.Z.S., F.R.E.S.

Cryptophagus dentatus, Hbst., ab. **flavus-clavatus**, n. ab.

This specimen agrees very well in size, structure, puncturation, and pubescence with the typical form, but the three-jointed club on both antennae is clear yellow in colour.

It came out of a piece of hawthorn stump from a hedge at Heston, Middlesex, on 7th May 1939. I kept pieces of the wood (and have still got them at the Museum), but no further specimens emerged; but a specimen of *Agriotes sobrinus*, Hbst., did so and larvae of *Hedobia imperialis*, L., are present (teste Blair). As it is such a striking looking insect and as the antennae are absolutely uniform, it seems to be worthy of a name. Type in coll. Donisthorpe in B.M.

Hydraena nigrita, Germ., ab. **pallida**, n. ab.

In the typical form the insect is jet black with red legs; but in *pallida* it is lighter or darker brown, the head being darker. Some specimens have the thorax lighter; but no black forms were found with *pallida*. *H. nigrita* is common in various streams in the Windsor Forest area, but the ab. only occurred in one stream. It was taken on 20th and 27th July and 1st August 1939, some 30 specimens having been taken. I thought at first it might be a different species as the puncturation of the head and thorax is perhaps a little more sparse, but Mr Balfour-Browne, junior, who kindly dissected a male, tells me that the genitalia of the two forms are identical. Type and cotypes in coll. Donisthorpe in B.M.

SOME ACULEATA OF EASTON.

T. Fred Marriner.

Though I have not devoted much time to the especial search for Bees, etc., I find I have accumulated a fairly representative collection of the Order in this Easton area of Cumberland, and these may prove of interest in adding new localities for most of the species observed, and taken. Of the *Vespidae*, *Vespa vulgaris*, L., is too common in some parts but varies, and has been seldom seen in others. *V. germanica*, F., I have only come across once. *V. sylvestris*, Scop., is fairly common in every portion of the area, while *V. rufa*, L., like *V. germanica*, is scarce around Easton. I got two specimens of *Odynerus* (*Ancistrocerus*) *parietum*, L., in my garden in 1936, the only ones I have seen. *Halictus rubicundus*, Chr., has not been uncommon on some of our hedgebanks.